CHAPTER 6:
Evaluating Air Emissions: Volatile Organic Compounds (VOCs)

The **CLEAN AIR ACT** (CAA) is the federal law which regulates air emissions from both stationary (e.g., factories) and mobile (e.g., vehicles) sources. Among other things, this law authorized the EPA to establish National Ambient Air Quality Standards (NAAQS) to protect public health and the environment. Regulations written to achieve NAAQS require that industrial facilities limit the amount of certain chemicals that they release to the air. For printers, the relevant regulations typically relate to volatile organic compounds (VOCs). VOC emissions lead to the formation of ground-level ozone or smog.

Introduction

Volatile organic compounds (VOCs) contribute to ground level ozone which is a health hazard. VOCs used at printing facilities are typically found in blanket and roller wash, screen cleaning solution, fountain solutions, heatset lithographic inks and solvent-based flexographic inks. Depending on the amount of these chemicals used, your facility will be placed into different "levels" for VOC emissions. These levels will determine your requirements.

Use Low Vapor Pressure Solvents

Printers should use the lowest vapor pressure solvents that allow them to operate the facility at an acceptable production level. Lower vapor pressure press washes will not evaporate as quickly as high vapor pressure washes.

Determining your PrintSTEP Air Level for VOCs

PrintSTEP has 5 "VOC Levels." Your facility's PrintSTEP VOC Level depends on your VOC emissions. You can choose one of two methods to determine your PrintSTEP VOC Level:

- The **Materials Use** method presented in this section is a simple method which allows you to estimate your PrintSTEP VOC Level based on the quantities of materials you use that may contain VOCs.

- The **Emissions Calculations** method presented in Appendix B allows you to calculate your air emissions more precisely and account for your efforts to reduce emissions, such as emissions control equipment. If you have such equipment and want credit for it in determining your VOC Level, you must use the Emissions Calculations method in Appendix E. The requirement to operate the emissions control equipment must be made enforceable in order to receive credit for the controls.

  Using the Materials Use Worksheet provided in this chapter, you can determine your facility's PrintSTEP VOC Level based on the quantities of materials you use. All you need to know is your facility's material usage for the last 12 months. By assuming that your air emissions result from using the materials identified on the Worksheet, the Materials Use method translates material use into air emissions and your corresponding PrintSTEP VOC Level. Therefore, this approach allows you to assess your facility's air emissions without doing complex calculations. If you would like more detailed information on the Materials Use method, see Appendix D.

  To determine your VOC Level, printers will need the following information:

  - records of materials used (e.g., purchasing and inventory records) within the past 12 months; and
  - material safety data sheets (MSDSs) and product data sheets for materials used at your facility.

  With this information, complete the Material Use Worksheet for your type of printing process.

Materials Use Worksheets

①	②	③
Printing Process	**VOC-containing Materials**	**Qty VOC-containing materials** used in the last 12 mo.
Sheetfed Or Non-Heatset Web Lithograph (No pollution control)	cleaning solvents	gals
		gals
		gals
	fountain soln additives	gals
		gals
	adhesives & coatings	gals
		gals
		gals
Screen Printing (No pollution control)	solvent-based inks	gals
		gals
		gals
	dilution & cleaning solvents	gals
		gals
		gals
	adhesives & coatings	gals
		gals

VOC Total

①	②	③
Printing Process	**VOC-containing Materials**	**Qty VOC-containing materials** used in the last 12 mo.
Heatset Web Offset lithography (No pollution control)	inks	lbs
		lbs
		lbs
	cleaning solvents	lbs
		lbs
	fountain soln additives	lbs
		lbs
	adhesives & coatings	lbs
Flexography or Rotogravure with water-based inks (No pollution control)	water-based inks*	lbs
		lbs
		lbs
	water-based coatings*	lbs
		lbs
		lbs
	water-based adhesives*	lbs
		lbs
		lbs
Flexography or Rotogravure with solvent-based inks (No pollution control)	inks	lbs
		lbs
		lbs
	dilution & cleaning solvents	lbs
		lbs
		lbs
	adhesives & coatings	lbs
		lbs

VOC Total

*** If your water-based materials contain more than 25% of the volatile fraction as VOC, you must use the "Flexography or Rotogravure with Solvent Inks" section.**

Materials Use Worksheet Instructions (see Appendix D for example)

COLUMN 1: Fill out the section of the Worksheet for the printing process at your facility only.

COLUMN 2: The listed types of materials are those that generate most of the VOC and emissions from the listed type of printing process. You do not need to include a listed type of material if you used less than 25 gallons of that type of material in the past 12 months. For example, if you used 1 gallon each of 30 different inks, your total use of this type of material (i.e., ink) would be more than 25 gallons and you would have to include it on your Worksheet.

COLUMN 3: For each type of material listed in Column 2, list the total quantity used in the last 12 months. Enter the total quantity of the material used regardless of the percentage content of VOCs. Be sure to enter the quantities ONLY in the units specified on the Worksheet. For example, screen printers will enter quantities in gallons only. If you need to convert a material quantity from gallons to pounds, multiply by the density of the material. If you need to convert from pounds to gallons, divide by the density (see MSDS). Density = specific gravity x 8.34 (lb/gal).

After completing the Materials Use Worksheet, determine your Air Level

Add up the pounds or gallons of VOC-containing material used (Column 3). Enter this total at the bottom of the Worksheet in the box labeled "VOC Total."

Now you use the Materials Use Worksheet totals to determine your PrintSTEP VOC Level. Using the appropriate Materials Use VOC Level Table below, find the Level associated with the total VOC-containing material you used, as recorded in the "VOC Total" box. Your level depends on what type of printing processes you use.

Material Use Level Table for VOCs

Check one:	Your VOC LEVEL is:
☐	VOC Level 1
☐	VOC Level 2
☐	VOC Level 3
☐	VOC Level 4
☐	VOC Level 5

Requirements for VOC Level 1

Materials Management

Complete the Air Level Worksheet (using either the Materials Use or Emissions Calculations Method) annually (on a calendar year basis) to assure that emissions do not exceed PrintSTEP VOC Level 1 thresholds.

Record Keeping

- Keep completed Air Level Worksheets on file.
- Keep annual materials usage records (on a calendar year basis) to demonstrate that the facility emissions qualify as VOC Level 1. This includes records of quantities of the materials listed on the VOC Level Worksheet, such as inks, cleanup solutions, fountain solution additives, coatings, and adhesives.
- Keep Material Safety Data Sheets (MSDSs) and product data sheets on file for materials used. Maintain records for 5 years.

Reporting

- The PrintSTEP application serves as a one-time notice of emissions, wastes, and releases, with no further reporting. If you exceed the Level 1 thresholds, you must submit a new PrintSTEP application to the state.
- If you are currently subject to additional reporting requirements, these requirements are still applicable under PrintSTEP.

Modifications

If you make modifications in your facility, see Chapter 10 for guidance on updating your PrintSTEP Notification.

Requirements for VOC Level 2

Materials Management

Complete the Air Level Worksheet (using either the Materials Use or Emissions Calculations Method) annually (on a calendar year basis) to assure that emissions do not exceed PrintSTEP Level 2 thresholds for VOCs.

Record Keeping

- Keep completed Air Level Worksheets on file.
- Keep annual materials usage records (on a calendar year basis) to demonstrate that the facility emissions qualify as VOC Level 2. This includes records of quantities of the materials listed on the Air Level Worksheets, such as inks, cleanup solutions, fountain solution additives, coatings, and adhesives.
- Keep Material Safety Data Sheets (MSDSs) and product data sheets on file for materials used.
- Maintain records for 5 years.

Reporting

An annual report must be submitted which documents compliance with VOC Level 2 thresholds. The report must also describe changes in facility operations which impacted emissions (increases or decreases).

Modifications

If you make modifications in your facility, see Chapter 10 for guidance on updating your PrintSTEP Agreement.

Requirements for VOC Level 3

Facilities in VOC Level 3 will have practically enforceable limitations imposed through PrintSTEP Agreements which keep their actual and potential VOC emissions below VOC Level 3 thresholds and thus major source thresholds for these pollutants. VOC Level 3 facilities will not be considered major sources for these pollutants due to their potential to emit.

Materials Management

Complete the Air Level Worksheet (using either the Materials Use or Emissions Calculations Method) annually to assure that emissions do not exceed PrintSTEP VOC Level 3 thresholds.

Monitoring/Testing

- In the event of a "permit deviation," the facility shall investigate and take corrective action immediately upon discovery of the permit deviation to restore the affected device, process, or air pollution control equipment to within allowable permit limits.

- If you are currently subject to additional requirements, such as limits on VOC content of inks or monitoring or control equipment, these requirements are still applicable under PrintSTEP.

Record Keeping

- Keep completed Air Level Worksheets on file.
- Keep materials usage records on a rolling 12-month basis sufficient to demonstrate that the facility emissions do not exceed VOC Level 3 thresholds. This includes records of quantities of the materials listed on the Air Level Worksheets, such as inks, cleanup solutions, fountain solution additives, coatings, and adhesives. For facilities using the Emissions Calculations Method materials content information must be maintained.
- Keep Material Safety Data Sheets (MSDSs) and product data sheets on file for materials used.
- Maintain records for 5 years.

Reporting

- An annual report must be submitted which documents compliance with VOC Level 3 thresholds, including the actual emissions, methods used in calculating the emissions, and the actual annual emissions speciated by individual regulated air pollutants, including a breakdown of VOC emissions by compound.
- The report must also describe changes in facility operations that impacted emissions (increases or decreases).
- The annual report must be submitted by April 15 of the following year. For example, the emissions report for calendar year 2000 shall be submitted by April 15, 2001.

Modifications

If you make modifications in your facility, see Chapter 10 for guidance on updating your PrintSTEP Agreement.

Requirements for VOC Level 4

Facilities in VOC Level 4 will have practically enforceable limitations imposed through PrintSTEP Agreements which keep their actual and potential VOC emissions below VOC Level 4 thresholds and thus below major source thresholds for these pollutants. Accordingly such facilities will not be considered major sources for these pollutants due to their potential to emit.

Materials Management

- Complete the Air Level Worksheet (using either the Materials Use or Emissions Calculations Method) annually to assure that emissions do not exceed PrintSTEP VOC Level 4 thresholds.

- Incorporate into the PrintSTEP Agreement any printing specific requirements that apply to the facility (e.g., limits on inks, coatings, other materials, cleaning solvents and performance requirements for add-on controls).
- The PrintSTEP Agreement can express the limits for lithographic blanket wash and other cleaning solvents in terms of vapor pressure (e.g., 10 mmHg @ 20°C).
- The PrintSTEP Agreement should explicitly specify the extent (time frame, equipment, and materials) to which averaging is allowed for demonstrating compliance (e.g., all inks used each month in the facility).

Monitoring/Testing

- For emissions caps, you should assure compliance with total emission limits based on an approved method of measuring material use and content, production rate, and/or operational parameters for specific emission units.
- Use EPA Method 24A only for publication rotogravure inks and related publication rotogravure coatings. Use Method 24 for all other inks, coatings, and adhesives.
- When using Method 24 on waterborne materials, use the precision adjustments when determining compliance of individual materials. When averaging materials or counting total mass emissions, do not adjust below formulation VOC content.
- For purposes of ink oil capture, the dryer should be operated at negative pressure instead of requiring heatset web offset printers to perform capture efficiency testing.
    - When counting facility emissions (mass per time), use the features specified in the emission calculations in Appendix E of the *Plain Language Workbook:*
    - 95% ink oil retention for non-heatset sheetfed and web offset lithographic inks;
    - 20% ink oil retention for heatset web offset lithographic inks;
    - 70% carryover of alcohol substitute fountain solution additive to dryer for controlled heatset web lithographic presses;
    - 40% carryover of low vapor pressure (less than 10 mmHg @20°C) automatic blanket wash through a control device to dryer for lithographic printing;
    - 50% retention of low vapor pressure (less than 10 mmHg @20°C) cleaning solvent in shop towels for lithographic printing as long as used towels are kept in closed containers.

Record Keeping

- Keep completed Air Level Worksheets on file.
- Keep materials usage records on a rolling 12-month basis sufficient to demonstrate that the facility emissions do not exceed VOC Level 4 thresholds. This includes records of quantities of the materials listed on the Air Level Worksheets, such as inks, cleanup solutions, fountain solution additives, coatings, and adhesives. For facilities using the Emissions Calculations Method, materials content information must be maintained.
- Keep Material Safety Data Sheets (MSDSs) and product data sheets on file for materials used.

- Maintain records for 5 years.

Reporting

- An annual report must be submitted which documents compliance with VOC Level 4 thresholds, including the actual emissions, methods used in calculating the emissions, and the actual annual emissions speciated by individual regulated air pollutants, including a breakdown of VOC emissions by compound.
- The report must also describe changes in facility operations that impacted emissions (increases or decreases).
- The annual report must also include the following information:
    - Facility information, including the following:
        - Source name;
        - Standard industrial Classification (SIC) code;
        - Physical address; and
        - Mailing address;
    - Identification of each VOC-emitting process or device;
    - Operating schedule during the high ozone season for each VOC-emitting process or device, including the following information:
        - Hours of operation per calendar day; and
        - Days of operation per calendar week.
    - Total quantities of actual VOC emissions for the entire facility and for each process or device, including the following:
        - Annual VOC emissions, in tons; and
        - Typical high ozone season day VOC emissions, in pounds per day.
    - The information for each printing press or device required to be recorded as listed above.
- The annual report must be submitted by April 15 of the following year. For example, the emissions report for calendar year 2000 shall be submitted by April 15, 2001.

Modifications

If you make modifications in your facility, see Chapter 10 for guidance on updating your PrintSTEP Agreement.

Requirements for VOC Level 5

Facilities in VOC Level 5 are considered Major Sources for VOC emissions and require a Title V operating permit from the NHDES. Contact the NHDES Air Resources Division at (603) 271-6793 for additional information.